

• General Description

The TF050N04N uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

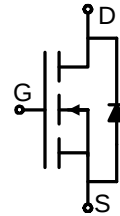
• Features

- Advance device constructure
- Low $R_{DS(ON)}$ to minimize conduction loss
- Low Gate Charge for fast switching
- Low Thermal resistance

• Application

Synchronous Rectification for AC-DC/DC-DC converter
Power Tools

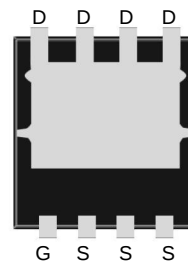
• Product Summary



$$V_{DS} = 40V \quad I_D = 80A$$

$$R_{DS(ON)(10V \text{ typ})} = 4.1m\Omega$$

$$R_{DS(ON)(4.5V \text{ typ})} = 5.2m\Omega$$



PDFNWB5x6-8L

• Package Marking and Ordering Information:

Part NO.	TF050N04N
Marking1	TF050N04N
Marking2	TF:tuofeng; AA:device code; Y:year code; X:Week
Basic ordering unit	5000 / PCS

• Absolute Maximum Ratings ($T_C = 25^\circ C$)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	$I_{D@TC=25^\circ C}$	80	A
	$I_{D@TC=75^\circ C}$	56	A
	$I_{D@TC=100^\circ C}$	48	A
Pulsed Drain Current ^①	I_{DM}	180	A
Total Power Dissipation	$P_D@TC=25^\circ C$	45	W
Total Power Dissipation	$P_D@TA=25^\circ C$	2.0	W
Operating Junction Temperature	T_J	-55 to 150	$^\circ C$
Storage Temperature	T_{STG}	-55 to 150	$^\circ C$
Single Pulse Avalanche Energy	E_{AS}	105	mJ

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	6.5	$^{\circ}C/W$
Thermal resistance, junction - ambient	R_{thJA}	-	-	50	$^{\circ}C/W$
Soldering temperature, wavesoldering for 8 s	T_{sold}	-	-	265	$^{\circ}C$

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.1	1.5	2.1	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=30A$	-	4.1	5.5	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	5.2	6.5	$m\Omega$
Forward Transconductance	g_{FS}	$V_{DS}=25V, I_D=20A$	-	12	-	S
Source-drain voltage	V_{SD}	$I_S=20A$	-	-	1.2	V

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	C_{iss}	$f = 1MHz$ $V_{DS}=20V$ $V_{GS}=0V$	-	2174	-	pF
Output capacitance	C_{oss}		-	146.3	-	
Reverse transfer capacitance	C_{rss}		-	150.5	-	

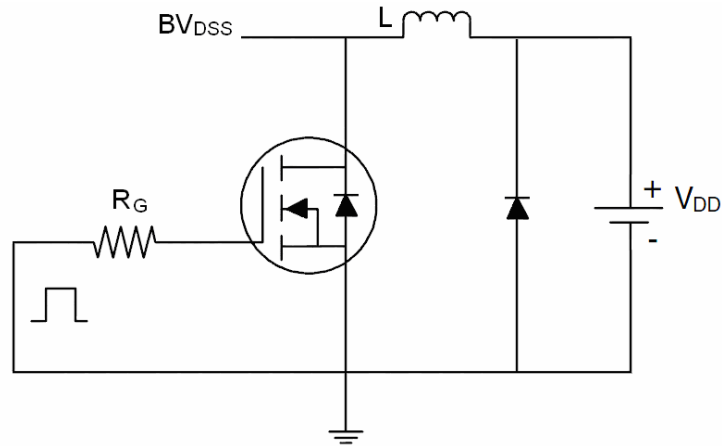
●Gate Charge characteristics($T_a = 25^{\circ}C$)

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Q_g	$V_{DD}=20V$	-	43.28	-	nC
Gate - Source charge	Q_{gs}	$I_D=30A$	-	23.93	-	
Gate - Drain charge	Q_{gd}	$V_{GS}=10V$	-	15.22	-	

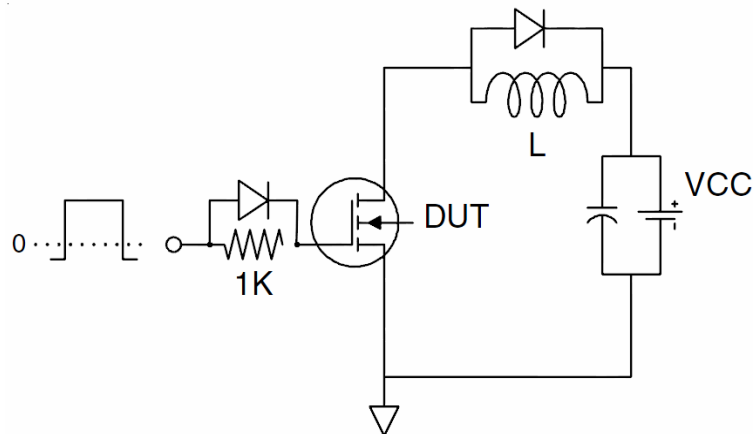
Note: ① Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;

Test Circuit

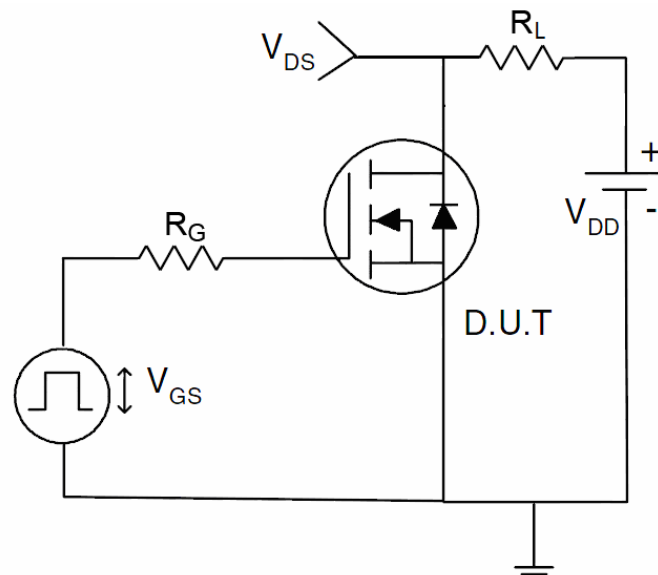
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

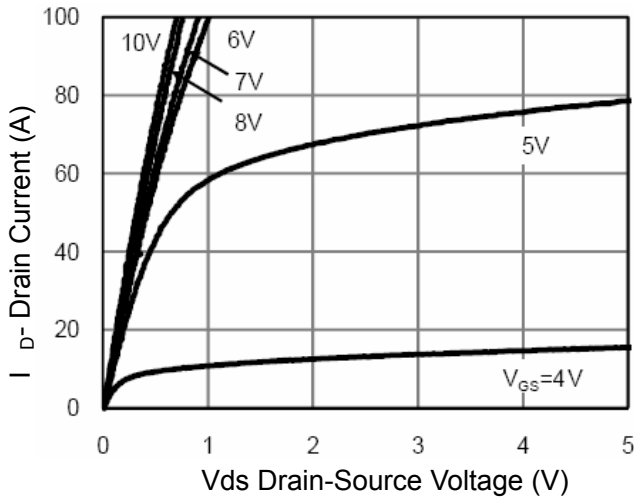


Figure 1 Output Characteristics

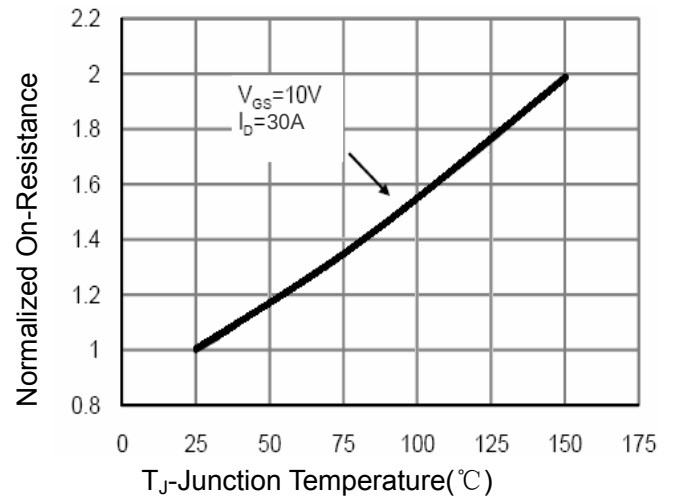


Figure 4 R_DS(on)-Junction Temperature

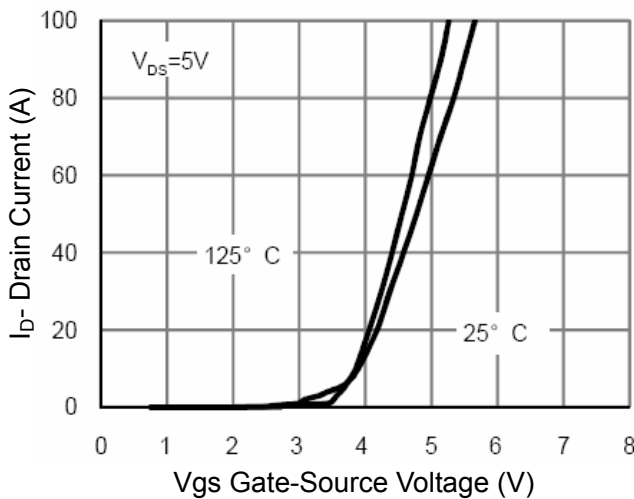


Figure 2 Transfer Characteristics

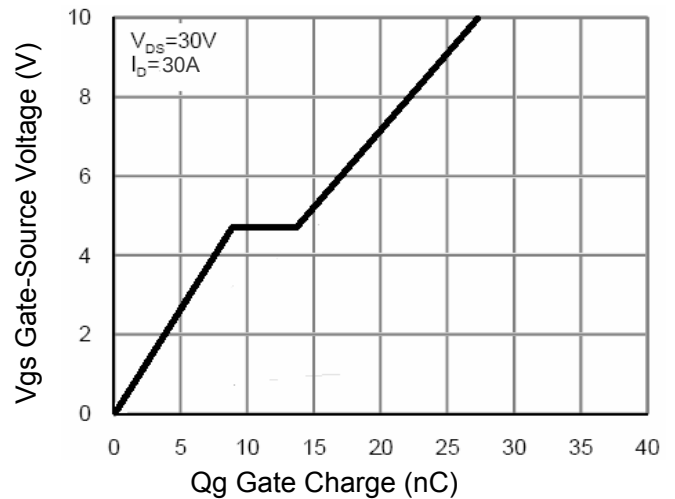


Figure 5 Gate Charge

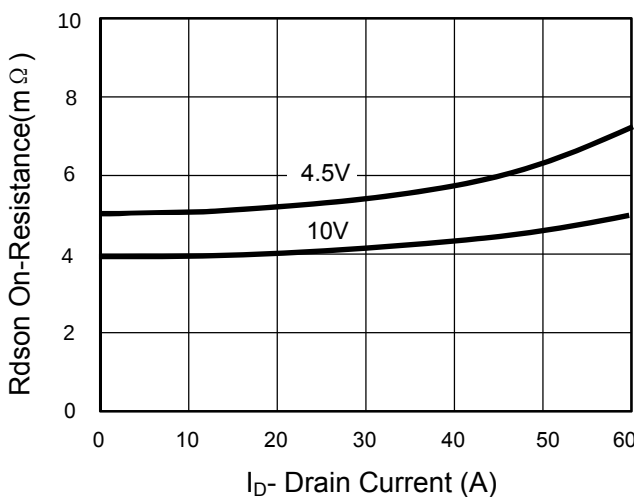


Figure 3 R_DS(on)- Drain Current

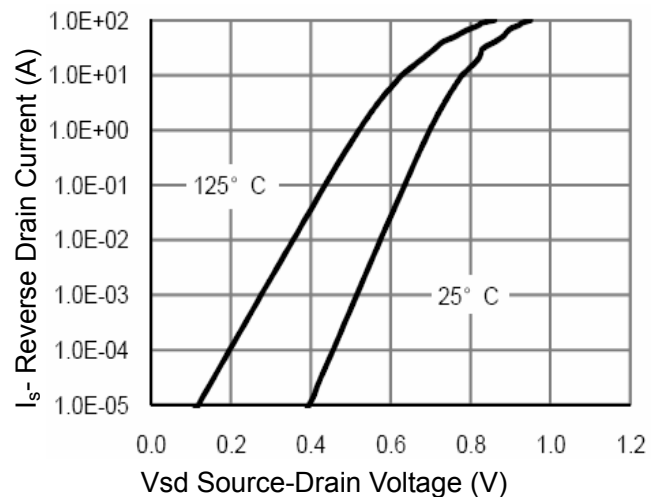


Figure 6 Source- Drain Diode Forward

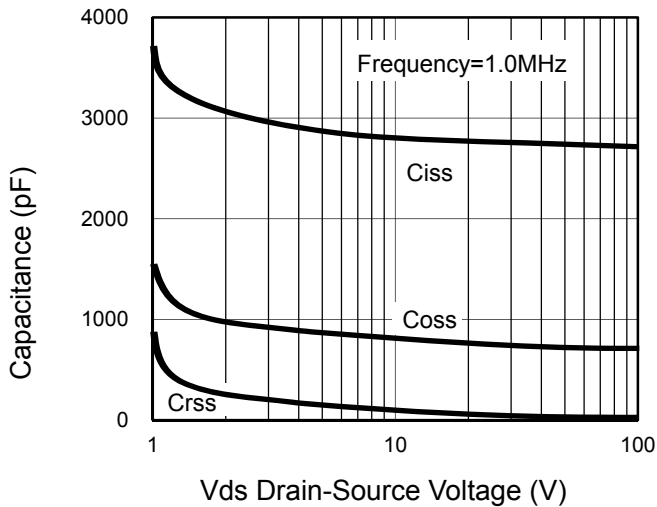


Figure 7 Capacitance vs Vds

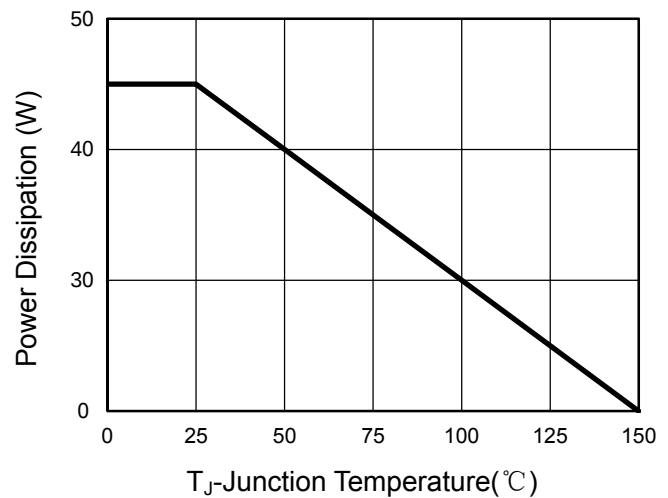


Figure 9 Power De-rating

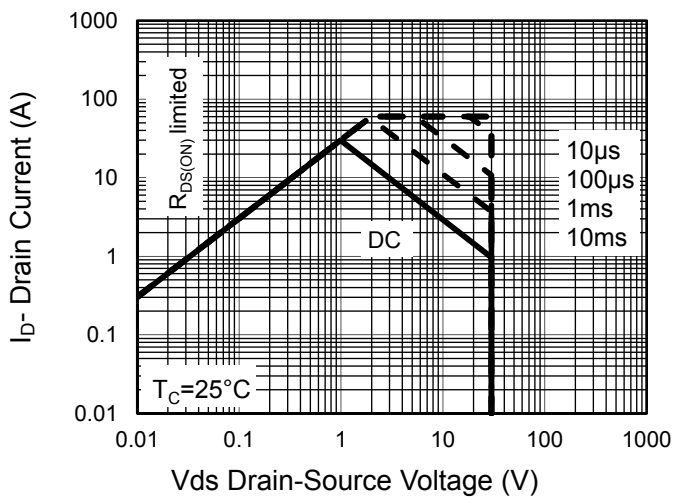


Figure 8 Safe Operation Area

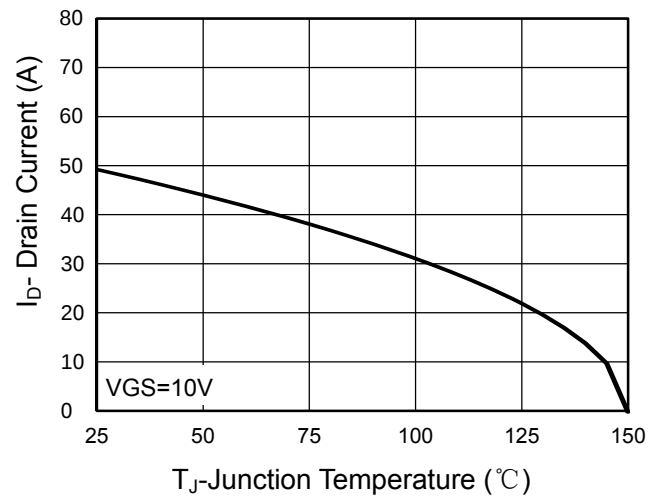


Figure 10 Current De-rating

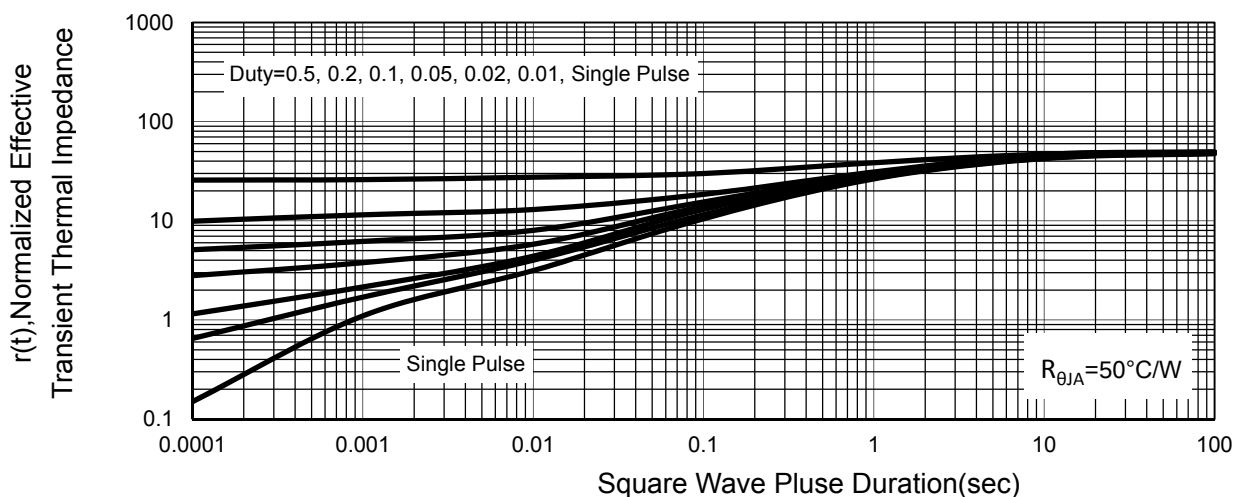
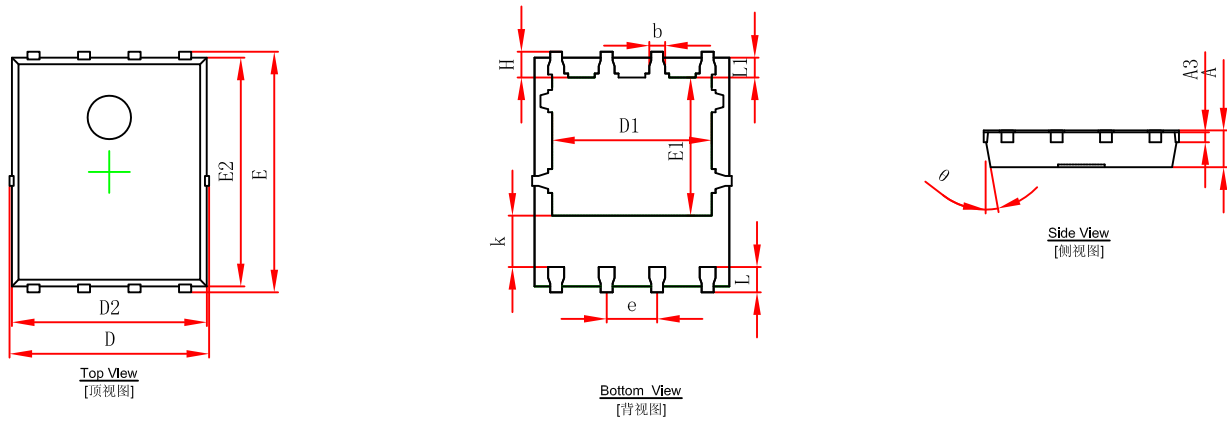


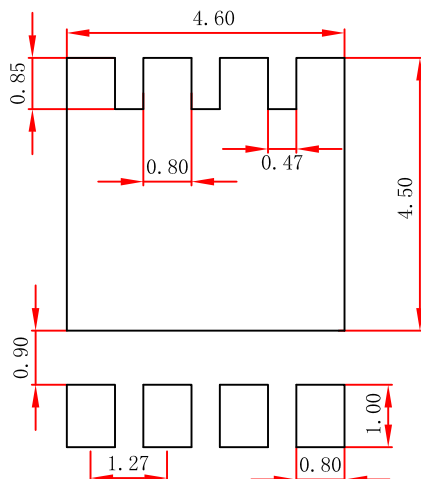
Figure 11 Normalized Maximum Transient Thermal Impedance

PDFNWB5x6-8L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°

PDFNWB5x6-8L Suggested Pad Layout



- Note:
1. Controlling dimension: in millimeters.
 2. General tolerance: $\pm 0.05\text{mm}$.
 3. The pad layout is for reference purposes only.